



HULL AND CARGO SURVEYORS, INC.
INLAND MARINE - INSPECTIONS - LOSS PREVENTION - SHIP & AIR CARGO
100 PINE STREET, SAN FRANCISCO, CALIFORNIA 94111
TEL. (415) 362-3791

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B31H8
1981

July 7, 1981

SFH 81002
BALCLUTHA
Contract No. CX 8140-1-0007
Reference S7219GOGA

Mr. Harry Dring
C/O Maritime Museum
Hyde Street Pier
San Francisco, CA 94101

Subject: Interim Report - Sailing vessel BALCLUTHA

Dear Mr. Dring:

Please find enclosed our interim report of survey. The report includes the following--

1. Ultrasonic plate thickness testing of interior shell plate.
2. Mast, spar and rigging survey.
3. An estimated cost of new sails provided by a local sail loft.

Ultrasonic Gauging

A Krump Kramer Branson CL202 Ultrasonic Gauge was used for testing, calibrated 1/29/81.

Shell plate was tested internally, on the waterline, three feet above and below the waterline, between each frame. Gaugings were then transposed to shell expansion blue prints using the following color code. Port gaugings are in black and red. Starboard gaugings, blue and red. Gaugings in red denote areas less than 0.300, 3/10 of an inch.

Mast, Spar and Rigging Survey

In keeping with the guideline established by our predecessors, our mast and rigging survey was based on blue print 219-2 drawn by David Seymore and accompanies the survey guide previously used by Capt. Fitzsimmons, Marine Surveyor in 1972.

We wish to thank Jim Williams and Robert Harris for their valuable assistance and cooperation during my survey efforts thus far.

Sails

Ms. Jocelyn Nash, Dewitt Sails was contacted by the undersigned regarding current costs of an entire sail inventory for the vessel BALCLUTHA.

Though the vessel has been an established museum for quite some time, it is not considered out of the realm of possibility to bring the vessel back to a limited sailing condition. We felt the quote would be an interesting addition to our report of survey.

We remain very truly yours,


Bruce Cibley

BC:tcd
encl.

Masts

BALCLUTHA
Survey Report

Date July 7, 1981

*See DJS Dwg. No.

CODE	MAST	DESCRIPT.	
F	1	Fore Housing	Pile of rust below heel
	2	" Lower Mast	Trestle tree, tops, severely wasted. Platform wood, broken and cracked. Bolts rusted and deteriorated. Platform need replacement.
	3	" Topmast	Heavy wastage to trestle tree mount. Top sail tye sheave frozer Parral band and collar bolts need replacement.
	4	" Topgallant	New wood 1976.
	5	" Royal	New wood 1976.
	A	" Partners	Moderate rust portside at partners.
M	1	Main Housing	Good
	2	" Lower Mast	Cross trees adrift. Top has bolts missing and severe deterioration. Holes in mast just below trestle tree.
	3	" Topmast	Bent forward 7°. Checking on heel lower top mast. Top mast separating from mast cap at top gallant. Top mast cap open. In need of rain funnel or cap. Open rivet holes along mast.
	4	" Topgallant	Light chaffing at mast cap to top mast.
	5	" Royal	Good
	A	" Partners	Good
MZ	1	Mizz Housing	Good
	2	" Lower Mast	Top platform, trestle trees, cheeks, etc. severely wasted should be replaced. Sheave frozen below bolster.
	3	" Topmast	Replaced 1979.
	4	" Topgallant	" "
	5	" Royal	" "
	A	" Partners	Good

Yards & FittingsBALCLUTHA
Survey ReportDate July 7, 1981

CODE	MAST	YARD	REMARKS
Y _F 1	Fore	Fore	Steel good condition, interior coated with fluid film.
2	"	Lower Topsail	Steel " " "
3	"	Upper "	Shackle for clew block worn to replacement. Parral band bolts wasted to replacement. Halyard sheave frozen. Halyard chain for sail wasted links, chain should be replaced. Starb. brace block o pendant is wasted, should be replace.
4	"	Topgallant	Wood spar new 1977, brace pendants P/S rusted, bunt band rusted, leather on parrel band is dry.
5	"	Royal	Same as top gallant condition.
Y _M 1	Main	Main	Fluid film creeping.
2	"	Lower Topsail	Good
3	"	Upper "	Bolts on parral band rusted to replacement.
4	"	Topgallant	Good
5	"	Royal	Crane truss band is loose around spar due to spar groove being too deep.
Y _{MZ} 1	Mizz	Crojack	Hemp lashings need replacement.
2	"	Lower Topsail	Sheaves frozen, birds nesting in sheave box. Links in halyard chain worn to replacment.
3	"	Upper "	Truss band at crane is loose, spar is loose in band.
4	"	Topgallant	Good
5	"	Royal	Good (1975 all yard brought down, patch welded, interior coated with fluid film)

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Booms & Fittings

Date July 7, 1981

CODE	DESCRIPT.	
3 1	Bowsprit	Holes P/S at heel chock.
3 2	Spanker Boom	Slight rot at gooseneck around iron work.
3 3	Spanker Gaff	Good, new 1979.
3 4	Dolphin Striker	Good

Shrouds & Fittings

SH _F 1	Lower Mast	All in fair condition, some siezings in need of replacement.
2	Topmast	Parcel and servings at mast have deteriorated, top seven ratlines siezed with old hemp should be replaced.
3	Topgallant	Ratlines replaced 1977 with tarred nylon.
SH _M 1	Lower Mast	Ratline siezings deteriorated, need replacement.
2	Topmast	Good
3	Topgallant	Good
SH _{MZ} 1	Lower Mast	Replace wire stoppings and servings around thimbles.
2	Topmast	Good
3	Topgallant	Good

Backstays(including wire, coating
fittings and spreaders)BALCLUTHA
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CODE	MAST	DESCRIPT.	
BS _F 1	Fore	Topmast (3)	Served eyes at mast, servings in need of replacement.
2	"	Topgallant (2)	Backstays need chafing gear at mast thumb cleats, in need of paint.
3	"	Royal (1)	Needs paint.
4	"	Spreaders	Rusted, brush and paint.
BS _M 1	Main	Topmast (3)	Good
2	"	Topgallant (2)	Good, needs paint.
3	"	Royal (1)	Good, needs paint.
4	"	Spreaders	Rusted, brush and paint.
BS _{MZ} 1	Mizz	Topmast (3)	Good servings and bolsters have been renewed since 1972 survey.
2	"	Topgallant (2)	Good
3	"	Royal (1)	Good
4	"	Spreaders	Good
BS _M A	Main	Mid Topmast	

BALCLUTHA
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Stays

(Including wire, coating, serving,
bolsters and fittings)

CODE	MAST	DESCRIPT.	REMARKS
S _F 1	Fore	Lower Mast (6)	Serving deteriorated at mast, bare wire expose. To be slacked off, raised and reserved.
2	"	Topmast	" " "
3	"	Jib	" " "
4	"	Outer Jib	" " "
5	"	Topgallant	Some rust brush and paint.
6	"	Royal	" "
S _M 1	Main	Lower Mast (4)	Serving deteriorated at mast, to be slacked off, raised and reserved.
2	"	Topmast	Rubber hose parceling good.
3	"	Topgallant	Some rust, brush and paint.
4	"	Royal	" "
S _{MZ} 1	Mizz	Lower Mast (6)	Bolsters starting and check and deteriorate. Slack rigging at mast to replace bolsters at time of reserving of mizzens. Turnbuckles beginning to rot.
2	"	Topmast	Good
3	"	Topgallant	Good
4	"	Royal	Good
S _B	Bowsprit	Bobstay	Starboard inner and outer stay chain wasted to replacement.
S _{OB}	"	Outer Bobstay	Port outer chain needs replacement sprit eye loose. Port inner stay chain wasted to replacement.

Recommendations

1. Replace all tops, trestle trees and cheek plates.
2. Fore top sail tye sheave to be cut out and boxed.
3. Parral band bolts and collar bolts to be replaced on foremast.
4. Patch weld holes in lower main mast.
5. Top main mast to have cap or rain funnel added.
6. Mizzen lower mast tye sheaves to be replaced and reboxed.
7. Replace servings fore topmast.
8. Chaffing gear to be added to foremast backstays under mast thumb cleats.
9. Paint foremast royal, top gallant and spreaders.
10. Paint main top gallants, royal and spreaders.
11. Weld patch or doubler holes P/S at heel chock, bow sprit.
12. Crop out rot at gooseneck on spanker boom, fill and fair.
13. Foremast siezings to be replaced as sighted.
14. Replace parcel and servings top foremast.
15. Replace siezings top seven ratlines fore topmast.
16. Replace siezings lower main mast as sighted.
17. Replace wire stoppings, lower mizzen mast thimbles at turnbuckles.
18. Replace parcelling and servings lower foremast at mast where wire is exposed.
19. Brush and paint foremast top gallant and royal.
20. Replace servings on mast, lower main.
21. Brush and paint main top gallant and royal.
22. Replace bolsters lower mizzen mast.
23. Replace bobstay chains - port outer chain and eye bolt port inner chain, starboard inner and outer chain.
24. Replace clew block shackle upper foremast.
25. Replace parrel band bolts upper foremast.
26. Replace halyard chain upper foremast.
27. Replace starboard brace block and pendant upper foremast.
28. Brush and paint brace pendants P/S top gallant foremast.
29. Bunt band on top gallant rusted to be brushed and painted.
30. Replace bolts on parrel bands upper main mast.

General Recommendations

1. Send down braces, down hauls, pendants, slush and replace all blocks where needed.
2. Cut out and replace tye sheaves and sheave boxes. Weld patch and fair mast holes. Replace metal work around and supporting tops.
3. Send down yards as noted. Replace halyard chains, foot ropes, lashing and paint yards as noted.
4. Slack off stays and shrouds as noted, raise up and renew parcel and servings.

General Recommendations (cont.)

5. Renew stropped siezed shrouds and replace turnbuckle covers as needed.
6. Paint, tar or slush all work.
7. Tune rigging.



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TEL. (415) 362-3791

September 25, 1981

REPORT _____ SFH 81002

Vessel: BALCLUTHA
National Park Service

On 9/18/81 the undersigned attended dry docking of above vessel at Pacific Dry Dock, yard #2, Oakland, California. Vessel shell plate was inspected on 9/21,22,23 and 24, 1981.

See previous report for internal and rigging conditions.

General Statement

Shell plate is in generally poor to fair condition. Extensive pitting exists overall with attendant deterioration of rivet heads. Water line area shows overall severe wastage plus considerable electrolytic deterioration both of original shell plate and existing doubler plate.

While structural integrity of hull is felt to be adequate for use as a museum, it is felt that overall condition will be in serious doubt if further deterioration occurs without major corrective measures to main hull girder connections.

Interior preservation using fluid film protection appears to have arrested wastage here. It is felt strongly that adequate measures should be taken to similarly protect exterior. Based on appearance of pitting and location along waterline, electrolytic action is the worst problem. An active cathodic protection system, maintained on a regular basis plus periodic haul out on an accelerated time frame should serve to preserve the hull but further corrective work is necessary.

Found

Original shell plate has pitted through in numerous areas. In general, these areas are concentrated in way of cast in place concrete inside hull along keel and stern

post and along waterline area.

Since garboard strake to waterline area shows average thickness ranging from .450 inches near keel to .250 inches just below waterline, it is felt that pitting is a localized problem best cured with local patches. Rivet head deterioration in this area can also be temporarily arrested by use of epoxy type compound applied as necessary.

Waterline area shows severe deterioration over full length. Original shell plate is holed through in many places. Doubler plate previously installed has also pitted through in some areas as well as showing considerable overall wastage. Apparently due to combination of physical abrasions and preferred current path, starboard side shows more deterioration than port.

Original doubler thickness was .375 (approx.) inches. Starboard side is now averaging .155 inches and port. .250. Worst areas will be cropped and renewed at this yard period but further renewals will be needed at succeeding haul-outs.

No apparent cause can be seen but area of bow and to a lesser extent, stern areas have worst deterioration overall. Bow will be almost completely doubled at this time and stern will require further doubling at next haul-out.

Doubler plate added at this time totals 1037 square feet. Previous doubler to be cropped and renewed totals 205.25 square feet.

It is estimated that a further 400 square feet will be necessary to crop and renew at next haul-out and about 500 square feet to be added in stern area.

Of interest is one area on starboard side where counterweight chain both abraded and provided electrolytic ground path. In this area, doubler plate was completely gone and shell plate on G-strake (old style) is down to about .100 inches thick. This is being repaired and/or doubled at this period.

Noted were many rivet heads wasted to point of no possibility of repair. Apparently the slightly different composition due to hot working of metal has allowed the rivets to become sacrificial in relation to surrounding plate. It is felt that the only final solution to these rivets is replacement at some future date. A specification to drill out and replace about 1000 rivets will have to be written into future repair orders.

In any case, ringing of rivet heads by welding is not recommended since this invariably leads to other problems along stake butts or laps.

Hull Work

Replacements and additions to doubler plate during this yard period are indicated on accompanying shell expansion print. Described verbally they include:

Crop & Renew: (old style strake designations)

Port-

G-strake frames	14-19
F-strake frames	115-120

Starboard-

F-strake frames	114 $\frac{1}{2}$ -120
G "	44 $\frac{1}{2}$ -56
F "	7-10

Added Doubler

Port-

E-strake frames	0-6
F "	4-9
G "	6-14
G "	19-23
D "	0-4 $\frac{1}{2}$
G "	98-107
F "	103-115
E "	112-120
D "	116-120

Starboard-

D "	116-120
E "	112-120
F "	102-114 $\frac{1}{2}$
G "	85-108
F "	48-51
G "	10-21
F "	0-7 10-15
E "	0-11

The renewed doubler is mostly an older addition not plug welded at frames. All new and renewed doubler will be edge welded and plug welded at frames.

With the exception of above noted thin areas in starboard doubler plate, this completes reinforcement of water-

line completely around the vessel. While this does not retain the original strength of the hull girder, it is felt that these repairs will adequately ensure hull integrity for use as a museum while tied to the pier.

Recommendations

To further restore hull to secure condition, badly wasted rivets should first be drilled out and replaced. After this is complete, areas where shell plate is pitted through should eventually be doubled over or replaced.

The difficulty of replacement in this lap riveted hull predicate repairs with doublers as compared to shell plate replacement. It is estimated that replacement would cost two to three times the cost of doublers.

Eventually rigging repairs must also be undertaken before hazard of falling items becomes a problem.

Currently, it is recommended that bottom be protected with hot plastic bottom paint to about 18 inches above waterline. This protection in conjunction with cathodic protection should serve to prevent further deterioration of shell plate or doubler plate.

Rudder gudgeons and pintles are also noted badly wasted. While rudder will not be in use, it will still be necessary to perform some repairs just to keep rudder in place.

It was noted that a water trap and considerable corrosion is found in way of frames 1-2 in sail loft area of lower hold. This is in conjunction with concrete cast in this area at some previous time. This area should be well cleaned, a limber hole provided and fluid film used for metal preservation.

Summary

While hull is not by any means in good condition, it is felt that above recommendations will serve to preserve and to a great extent restore this hull to condition commensurate with intended use as a museum vessel.

Robert A. Wehnau

Req. by: H. Dring
Nat'l. Park Service HULL AND CARGO SURVEYORS, INC.

RAW:tcd

